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## Designing Chemistry Practice Exams for Enhanced Benefits. An Instrument for Comparing Performance and Mental Effort Measures

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# Designing Chemistry Practice Exams for Enhanced Benefits. An Instrument for Comparing Performance and Mental Effort Measures

## **Abstract**

The emergence of students using cell phones and particularly the photographic capabilities of smartphones to cheat on exams is noted. The specific threat this form of academic misconduct poses to the ACS Examinations Institute is addressed in particular.

## **Keywords**

general public, testing/assessment

## **Disciplines**

Curriculum and Instruction | Educational Assessment, Evaluation, and Research | Higher Education | Other Chemistry | Science and Mathematics Education

## **Comments**

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# What Might Cell Phone-Based Cheating on Tests Mean for Chemistry Education?

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**ABSTRACT:** The emergence of students using cell phones and particularly the photographic capabilities of smartphones to cheat on exams is noted. The specific threat this form of academic misconduct poses to the ACS Examinations Institute is addressed in particular.

**KEYWORDS:** General Public, Testing/Assessment



One new reality of teaching in the 21st century is that students and their cell phones are an apparently inseparable combination. Indeed, the advent and ubiquitous availability of smartphones, such as iPhones or Android phones, means that most students of general chemistry have substantial communication capability, including image capture, when they arrive at our classrooms. There are many challenges and opportunities associated with this student propensity for cell phone usage. Instructors have noted and researchers have studied the relationship between student cell phone use and academic performance.<sup>1–3</sup> Efforts are even being made to incorporate cell phone use into instruction through capabilities associated with classroom response systems or the use of interactive course management or content management systems, some of which have been highlighted recently by Williams and Pence.<sup>4</sup>

The magnitude of change associated with the emergence of mobile platform technology could naturally lead to the concern that students may also use cell phones for more nefarious reasons in their courses. In particular, reports of students seeking to gain information during testing appear to be increasing, certainly at the ACS Examinations Institute (ACS-EI). Use of cell phones to search for answers on the Internet or seek information from a classmate is not new and could be very difficult to offset.<sup>5</sup> Additionally compounding this issue is the difficulty instructors face on enforcing a “no cell phone” policy during either instruction or testing.<sup>6</sup> For example, few chemistry instructors are familiar with the types of fourth amendment legal concerns related to searching the contents of a cell phone that could arise when students are caught using that cell phone for cheating on an exam.<sup>6,7</sup>

At ACS Exams, threats to the security of copyrighted material are also not new. In the past decade this type of threat has taken different forms from posting of a secure test to distributing scanned copies of the study guides. A key factor, however, is that in each of these cases the distribution technology has been the Internet. More recently the concerns related to exam security have escalated due to the use of cell phones to both obtain images of secure tests and, at least potentially, distribute these images. Unlike in the past, the capture and distribution of these images is much more difficult to track as these could occur without posting on the Internet but rather between two cell phones via text. Reports have been made to ACS-EI from professors who have strong evidence (including video evidence) of students taking pictures of exams with cell phones.

## ■ WHAT THEN CAN WE DO?

At ACS Exams, we are considering the rising concern of cell phone-based cheating in a number of ways. Our key strategy for limiting the compromise of exams is to continue the current practice of sustained and regular searches for materials from ACS-EI on the Internet. The premise is that phone-to-phone sharing of images has limitations to the spread of those images. So, exams that have been photographed and not distributed via the Internet are considered locally compromised rather than globally compromised. Nonetheless, the risk of wide compromise is certainly accentuated if students are in possession of images, so we are also considering alternative ways of addressing the issue. One response may be to alter some of

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our practices for releasing tests. This strategy could include producing tests more often (shortening the time between versions of any given exam) or increasing the availability and flexibility of exams via our new, secure, online testing platform. These strategies would simultaneously limit the value of any images captured by students (because the exam itself may change before cheating students access the “bootlegged” image) as well as lower the response time to make new exams available to users in cases where broader compromises occur.

Either of these possibilities requires investments in the exam development capacity at ACS-EI. One of the most important features of ACS Exams is the quality of the test items we use, and that quality is associated with the exam development process.<sup>8</sup> Fortunately, ACS-EI enjoys the effort of an excellent community of instructors who serve and could serve on exam committees. We have also been establishing a capacity to deliver exams electronically for the past several years. Research and development at ACS Exams has already begun to work on this longer-term solution with the intent to deliver hybrid tests that allow instructors some content coverage flexibility while maintaining an ability to provide norm-based information to users and extended reporting by content area. As our goal is to deliver the highest quality, secure exams to our community of instructors, we will continue to investigate and implement the best methods to offset any risk to this goal.

As instructors, being cognizant of the changing educational environment and the perspectives our students may have about their education seem to be worth exploring. For example, taking some instructional time to enhance our students' understanding of ethics, particularly scientific ethics, and how this relates to intellectual property may help them long-term through their academic careers and into their professional lives. The legal issues related to intellectual property seem to change often these days, but this type of variability is not a new problem. As we all have a vested interest in maintaining the highest level of scientific integrity, education for students on matters related to ethics may be critical. Maintaining the integrity and security of how and what we test is only one component of this. For the immediate future ACS-EI will continue to assess possible threats related to cell phone misuse. Importantly, the chemistry education community has always been the most important link in efforts to maintain the security of ACS Exams, so we all need to be more aware of the issues related to students using cell phones to cheat on tests. We can minimize the number of cell phones in testing environments through “no cell phone” policies during exams, perhaps by using cell phone hotels,<sup>5</sup> as is lightheartedly suggested in the graphical abstract. Finally, we can strive to be more comprehensive in our messages about ethics and education with our students so they are hopefully less likely to resort to cheating on any tests.

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### Notes

Views expressed in this editorial are those of the authors and not necessarily the views of the ACS.

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Thomas A. Holme is a professor in the Department of Chemistry, Iowa State University. His research has two distinct strands: chemical education research, and computational chemistry. He served as Director of the Examinations Institute of the American Chemical Society from 2002 to 2015, and conducts education research to improve the quality of information that can be obtained from exams and other forms of assessment.

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